

CONSOLIDATED BILLING SYSTEM AND METHOD  
FOR USE IN TELEPHONY NETWORKS

5

FIELD OF THE INVENTION

The present invention relates generally to  
10 billing systems for telephony networks, and more  
particularly, to a system and method of integrating  
billing information acquired from a third-party service  
provider with network billing information and producing  
consolidated customer invoices for usage of network and  
15 third-party services and equipment.

BACKGROUND OF THE INVENTION

20 Telephone service providers typically employ a  
billing system to produce monthly invoices based on  
customer usage of telephony network resources and  
equipment. Such conventional billing systems typically  
constitute an amalgam of disparate computer and data  
25 processing systems which must cooperate harmoniously in  
order to produce a great number of customer invoices on  
a cyclical basis. Modifying such billing systems to  
accommodate new services and functionality presents a  
significant challenge to the providers of telephony  
30 network services. Current telephony network billing  
systems are generally unable to support additional  
billing requirements necessary to expand the scope of

services which can be offered by telephony network  
service providers.

It can be appreciated that modifying a complex  
billing system that processes tens of millions of  
5 customer invoices each month is both a problematic and  
expensive proposition. The inability to effect such  
modifications, however, can result in a loss of market  
share and a reduction in the future growth of  
telecommunications companies which typically compete for  
10 business within a common customer pool. There is a need  
in the telecommunications industry for a billing system  
and methodology that can accommodate current and future  
telephony network service billing requirements. There  
exists a further need for such a billing system which  
15 does not require significant redesign of existing  
billing system architecture. The present invention  
fulfills these and other needs.

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#### SUMMARY OF THE INVENTION

The present invention is directed to a billing  
system and method particularly well suited for use in  
telephony networks. A billing system and methodology  
25 that operates in accordance with the principles of the  
present invention accounts for usage of standard network  
services, such as voice and data communication, and  
third-party services, such as paging and voicemail  
services, supportable by the network. Customer usage of  
30 network equipment and third-party equipment is also  
accounted for by a telephony network billing system  
operating in accordance with the principles of the

present invention. Network and third-party usage and equipment charges incurred by a customer are advantageously integrated by the billing system into a single customer invoice.

5       The above summary of the present invention is not intended to describe each embodiment or every implementation of the present invention. Advantages and attainments, together with a more complete understanding of the invention, will become apparent and appreciated  
10 by referring to the following detailed description and claims taken in conjunction with the accompanying drawings.

#### 15                   BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an illustration of a conventional telephony network over which voice and data information is typically communicated, with usage and non-usage  
20 charges accounted for by a computer-based billing system;

Figs. 2-5 illustrate various processing modules and associated data flows concerning an invoice processing methodology in accordance with one embodiment  
25 of the present invention;

Fig. 6 illustrates an expanded set of services and features which may be supported by a telephony network, the billing of which is provided through use of an invoice processing system and methodology in  
30 accordance with an embodiment of the present invention;

Fig. 7 illustrates various processing modules and data flows which provide for the integration of

billing information acquired from a third-party service provider with network billing information, and the production of consolidated customer invoices for usage of network and third-party services and equipment;

5           Fig. 8 illustrates in flow diagram form various steps associated with establishing an installment order for a pager unit provided to a telephony network customer by a pager service provider;

          Figs. 9-10 are flow diagrams that illustrate  
10   various steps involving the acquisition of paging equipment charge records provided by a pager service provider and various steps associated with the processing of pager and non-pager usage charges by an invoice processing system and methodology in accordance  
15   with an embodiment of the present invention;

          Fig. 11 depicts various process steps performed by the invoice processing system shown in Fig. 7 in connection with the production of customer invoices which include equipment and usage charge information for  
20   both paging and non-paging services;

          Figs. 12-15 illustrate various processing modules and data flows associated with the process steps depicted in Fig. 11; and

          Figs. 16A-16G illustrate various pages of an  
25   illustrative customer invoice that includes equipment and usage charge information for both paging and non-paging services.

          While the invention is amenable to various modifications and alternative forms, specifics thereof  
30   have been shown by way of example in the drawings and will be described in detail hereinbelow. It is to be understood, however, that the intention is not to limit

the invention to the particular embodiments described.  
On the contrary, the invention is intended to cover all  
modifications, equivalents, and alternatives falling  
within the spirit and scope of the invention as defined  
5 by the appended claims.

#### DETAILED DESCRIPTION OF THE VARIOUS EMBODIMENTS

10 In the following description of the  
illustrated embodiments, references are made to the  
accompanying drawings which form a part hereof, and in  
which is shown by way of illustration, various  
embodiments in which the invention may be practiced. It  
15 is to be understood that other embodiments may be  
utilized, and structural and functional changes may be  
made without departing from the scope of the present  
invention.

Referring now to the drawings, and more  
20 particularly to Fig. 1, there is illustrated a  
generalized block diagram of a conventional telephony  
network 20 over which voice information 24 and data 26  
may be communicated. Various types of equipment 22,  
such as telephones and modems for example, provide  
25 access to the telephony network 20. A typical network  
20 includes a billing system 28 which accounts for  
customer use of the telephony network infrastructure  
(e.g., usage charges) and equipment rental (e.g., non-  
usage charges).

30 Usage and non-usage charge information is  
acquired and processed by a conventional billing system  
28 to produce, for example, a customer invoice 30. It

is noted that acquiring and processing equipment and network usage charge information within the context of a conventional billing systems 28 is often accomplished using a number of disparate systems and processing  
5 methodologies. A final merging of dissimilar usage and non-usage charge data streams is typically required in order to consolidate all applicable customer charges on a single invoice.

Those skilled in the art of invoicing and  
10 billing systems for use in telephony networks appreciate the substantial effort and expenditure required to coordinate a myriad of data acquisition and processing methodologies in order to accurately produce customer invoices on a cyclical basis. By way of example, U.S.  
15 Sprint, through considerable effort and cost, has developed an Invoice Processing System (IPS) which represents the industry's first consolidated invoicing and telemanagement reporting system for residential and business customers. The IPS replaced some nine  
20 individual billing systems, and provides invoicing and reporting capabilities sufficient to support in excess of 10 million customers served by U.S. Sprint.

The Invoice Processing System originally developed by U.S. Sprint provides for the efficient  
25 processing of voice 24, data 26, and equipment 22 usage within a telephony network 20. Those skilled in the art will readily appreciate the complexity of a billing system infrastructure which efficiently and accurately processes on the order of tens of millions of customer  
30 usage and non-usage charges on a monthly basis. Notwithstanding the sophistication of the original IPS and other conventional billing systems, the present

consumer demand for new technologies and services, such as voicemail and paging services for example, has presented new and challenging problems to the designers of billing system architecture for telephony networks.

5           A billing system and methodology in accordance with the principles of the present invention provides for consolidated accounting of present and future services and features supportable by a telephony network. Charges associated with services and equipment  
10 offered by third-party service providers (i.e., non-telephony network service/equipment providers), such as paging and voicemail service providers, are seamlessly integrated along with standard service (e.g., voice and data) charges to produce consolidated customer invoices.

15           Figures 2-6 illustrate various aspects of one embodiment of a billing system infrastructure within which the present invention may be utilized. Customer billing may be processed in two separate phases. The first phase, which may be referred to as call  
20 processing, acquires call or usage data from the telephony network 20 and performs a series of edits. During this phase, the data is batched, formatted, reviewed, authorized, and rated. A Message Processing System (MPS) prepares the call data for the next phase  
25 of the billing process.

          The second phase, which may be referred to as invoicing, acquires the call records, aggregates them by cycle and customer, and then prepares the actual customer invoices. An Invoice Processing System 128,  
30 which is shown in Fig. 6, performs the invoicing functions through use of seven major subsystems, including an online tables subsystem 32, a cycle

preparation subsystem 34, an invoice calculation  
subsystem 36, invoice verification and production  
subsystems 40, 38, a controls and reporting subsystem  
44, and an outbound interface subsystem 42. The  
5 controls and reporting subsystem 44 and outbound  
interface subsystem 42 respectively establish parameters  
for internal IPS design management and data flow to and  
from various system databases.

The online tables subsystem 32 drives the  
10 invoicing process. Among the many functions performed  
by the online tables subsystem 32 are defining billing  
run parameters, maintaining product and rate structures,  
and specifying report requirements for customer billing.

After determining the parameters for a  
15 specific cycle set up, the IPS module 128 pulls the  
appropriate call detail records from the Message  
Processing System and sequences a customer's data  
acquired from other systems, such as from the Customer  
Information System (CIS), Enterprise System (ES),  
20 accounts receivable system, and other systems. Finally,  
the cycle preparation subsystem 34 allows special  
billing requests, such as those outside of their normal  
cycle, to be processed.

The calculation of invoices is a primary  
25 operation performed by the IPS module 128. Invoice  
calculation may be viewed as being effected through two  
major sets of operations, namely, Calculation I and  
Calculation II processing operations. The Calculation I  
process acquires the authorized customer profile and  
30 applies all account-level monthly recurring, non-  
recurring, and usage charges, as well as account-  
specific discounts. Charges are determined by various



algorithms and rate tables. For tapered 800 and WATS services, for example, the call detail records are re-rated according to applicable tariff requirements.

The Calculation II process is used to process  
5 hierarchical structures, discounts, and commissions (e.g., public phones). During the Calculation II process, hierarchical-level discounts are computed where applicable. The Calculation II process then applies promotions and discounts, as well as determining taxes  
10 at the call level after all discounts have been applied.

Prior to printing invoices and reports, the IPS module 128 verifies that all information on randomly selected customers within a given cycle is accurate. During this verification operation, the IPS module 128  
15 checks its own processing by reviewing sampling invoices for each customer profile type contained in the cycle. Among the more than 350 verification parameters checked are rates, time of day, product, promotions, and taxes.

After the accuracy of the sample invoice data  
20 has been verified, the IPS module 128 decouples the invoices and telemanagement reports and creates electronic images for final production in the media formats selected by a customer. Invoices are printed and then dispatched to the applicable customers.

Referring to Fig. 6 in greater detail, there  
25 is depicted a telephony network 20 which supports basic voice 24, data 26, and equipment 22 services, along with a number of new services and features not contemplated at the time of the initial telephony network design.  
30 Services such as voicemail 100, voicemail with caller ID 102, paging and group paging 104, roaming services 112, and message dispatching services 114 have become popular

services which are routinely requested by the consumer. Other services, such as equipment insurance 106, out of service area message retrieval and retransmission 108, and PCS paging support 110 are examples of new services  
5 which are believed to be of interest to the consumer.

Present telephony network billing systems are currently incapable of accounting for new and standard services and features such that all charges for all services and features contracted by a customer,  
10 including third-party services, are presented in a single consolidated customer invoice. The inability of present billing systems to account for usage and non-usage charges for new services and features significantly limits the ability of telephony service  
15 providers to introduce such services and features to current and future customers.

For purposes of illustration and not of limitation, various features and advantages of the present invention will now be described within the  
20 context of new paging services offered by a third-party service provider which are supported by the telephony network depicted in Fig. 6. It is to be understood that the following description with respect to paging services is not intended to limit the scope of the  
25 present invention. Other services, including those yet to be developed, which may utilize the telephony network 20 and be accounted for in a manner consistent with the principles of the present invention come within the scope of the present invention.

30 In accordance with the embodiment illustrated in Fig. 6, an integration interface 126 cooperates with an Invoice Processing System 128 to account for all

network and third-party services and features supportable by the telephony network 20. As is depicted in Fig. 6, the integration interface 126 provides for the acquisition and pre-processing of standard usage and non-usage charges (e.g., for voice and data services/equipment), paging charges (e.g., for pager and voicemail services/equipment), and other service charges for subsequent processing by the IPS module 128.

Enhancements in IPS functionality, as will be described hereinbelow, provides for the incorporation of usage and non-usage charges for new services and features along with standard usage and non-usage charges for presentation on a customer invoice 130. Cooperation between the IPS module 128 and integration interface 126 provides the opportunity for telephony network service providers to expand the type and nature of services and features which may be offered to the consumer.

Referring now to the system block diagram of Fig. 7 and process flowcharts of Figs. 8-11, there is illustrated one embodiment of the present invention in which a telephony network of the type illustrated in Fig. 6 has been expanded to include new paging services. The system illustrated in Fig. 7 advantageously integrates third-party pager services with existing voice and data network services. The Invoice Processing System 128, through cooperative operation with the integration interface 126 which includes a number of upstream processing modules, provides for integrated customer invoicing of conventional and paging service and equipment charges.

A pager service provider 152 is depicted in Fig. 7 as being situated external to the billing system

125 of the telephony network 20, as is indicated by the dashed demarcation line. The pager service provider 152 typically offers a number of paging services in addition to equipment rental options.

5           In accordance with one embodiment, and as depicted in the flow diagram of Fig. 8, the billing system 125 generates an order record 160 which is subsequently completed and returned by the pager service provider 152 in order to activate paging services for a particular customer. The billing system 125 includes a  
10   Customer Premise Equipment (CPE) module 144 which initiates the order record generation process. The order record generated by the CPE module 144 identifies 162 the customer and nature of the request. For  
15   example, the order record may identify whether the customer is a new or current customer, whether a new or add-on service or feature has been requested, whether a change in a particular service or feature has been requested, or whether cancellation of a service or  
20   disconnection of equipment has been requested.

          If the CPE module 144 determines 164 that a particular customer is ordering more than one pager unit, for example, a unique sequence identifier is generated 166 for each pager associated with the  
25   particular customer. The order record is then transmitted 168 electronically to the pager service provider 152. The pager service provider 152 completes 170 the order record by inserting a unique pager identification number (PIN) code associated with each  
30   pager for a particular customer. The order record completed by the pager service provider 152 is then transmitted 172 to the CPE module 144 module of the

billing system 125. The CPE module 144 generates a CPE charge record for each pager unit which is subsequently operated on by the IPS module 128. The CPE charge record information is ultimately reflected on a customer invoice 130 as an equipment charge at the appropriate location on the invoice 130.

The pager service provider 152 accumulates pager usage charges during a given period of time for all customers using paging services supported by the telephony network 20. Usage charge information for each customer and pager unit is transmitted by the pager service provider 152 to the Custom Billing Services (CBS) module 148 of the billing system 125. A standard file layout containing the information needed to determine how many pages a particular customer received is typically transmitted between the pager service provider 152 and CBS module 148 on a cyclical basis.

As is shown in greater detail in Fig. 9, the pager service provider 152 prepares 180 a paging service account record for each pager associated with each customer. If a particular customer 182 has more than one pager, a separate account report is prepared 184 by the pager service provider 152 for each pager. As previously mentioned, a unique sequence number is incorporated 186 into the account record for each pager. The pager service provider 152 further inserts 188 customer ID information for each account record. Usage information computed by the pager service provider 152 is inserted 190 into each customer record. The customer records prepared by the pager service provider 152 are then transmitted 192 to the billing system 125 of the telephony network.

Referring to Figs. 7 and 10, the CBS module 148, upon receiving paging service account records 200 from the pager service provider 152, initiates conversion of the raw data contained within the account records to a voucher file format 202. The raw data, which is formatted according to the voucher file format, is validated 204 to verify the accuracy and integrity of the raw data supplied by the pager service provider 152. If errors are detected 206 in the raw data, edits are made 208 to correct the errors. If the errors cannot be corrected 210, the account record is rejected 212 and a control report is generated 212 by the CBS module 148 alerting system administrators as to the particulars of the unresolved errors.

Vouchers that have been validated by the CBS module 148 are uploaded 214 to an open gateway module 142. The open gateway module 142 distinguishes 216 paging usage records from non-paging usage records. Each voucher typically includes a service type field that specifies whether the voucher is associated with a paging service or a non-paging service. Voucher charge records are then further processed 218 by the Extract Load (XL) module 140 and IPS module 128.

With reference to Figs. 7, 11-15, there will be described in greater detail various operations performed by the extract load module 140 and the IPS module 128 concerning the processing of equipment charges, standard voice and data service charges, and pager service usage charges. It is noted that the processes depicted in Figs. 12 and 13 are associated with processing of non-usage charges acquired/processed by the CPE module 144. The processes depicted in Figs.

14 and 15 are associated with processing of usage charges (e.g., vouchers) acquired/processed by the CBS module 148.

The XL module 140 receives 220 equipment charge records from the CPE module 144 and voucher charge records from the CBS and open gateway modules 148, 142 associated with both paging and non-paging services. The XL module 140 sorts the CPE charge records, typically by customer, extracted from the CPE module 144 and transfers these records to the IPS module 128, as is depicted in Fig. 12. The IPS module 128 identifies 222 CPE charge records by analyzing 224 a synonym ID code embedded in each CPE charge record file.

The IPS module 128 analyzes 224 the synonym ID code of each CPE charge record, or file, in order to identify the service usage category associated with a particular customer's pager. For example, the synonym ID code #1 indicates that the customer has a package arrangement under which various services and features are bundled together along with rental of a paging unit. Other synonym ID codes indicate whether a particular customer paging unit has associated with it local, regional, or national usage services, numeric paging, alphanumeric paging, and what type of basic pager service has been established for the particular pager unit. The synonym ID code may also include information concerning the application of various types of discounts and whether charges are recurring or non-recurring. A generalized flow diagram concerning the processing of CPE charge records is illustrated in Fig. 13.

The IPS module 128 also identifies 226 paging usage records in the form of voucher charge records

received from the XL module 140. The IPS module 128 determines the rate for the service associated with each voucher charge record and applies 230 the appropriate unit charge, previously determined by the CBS module 148, and unit discount rates for each pager package. The pager PIN code for each voucher charge record is extracted 232 so as to uniquely identify all charges associated with each pager possessed by a particular customer.

Reference is made to Figs. 14 and 15 which depict various steps concerning the processing of voucher charge records performed by the IPS module 128. Using the CPE and voucher charge record information, the IPS module 128 processes 234 customer invoices and locates usage and non-usage charges for standard services as well as pager services on each customer invoice 130. The invoices are printed 236 and then dispatched to individual customers.

Additional features and aspects of the process flow diagrams of Figs. 12-15 and invoice depictions of Figs. 16A-16G will now be described in greater detail. As is shown in Fig. 13, CPE charge records are processed by a discount and promotion accumulation module 302. The discount module 302 differentiates paging item level discounts from other item level discounts. A field in the CPE record files received by the IPS module 128 is used to identify paging item level discounts.

Each paging item level discount is written to a discount file separately and can be identified as relating to paging services using a paging switch field, such as by setting the paging switch field to "Y" for indicating paging. It is noted that the discount module



302 also processes voucher records, as is shown in Fig. 15, in a similar manner with respect to voucher discount files. It is further noted that the voucher charge processing module 309 shown in Fig. 15 moves the fields  
5 needed to process the voucher records in the voucher file to a voucher external view.

CPE discount files are then further processed for purposes of preparing customer invoices. A discount activity module 304 identifies CPE discount files that  
10 include an appropriately set paging indicator flag. The activity module 304 moves the new discount file paging indicator flag to the CPE discounts view paging indicator flag, which is used to identify paging discounts.

15 A charge report formatter module 307 provides for the displaying of one or more pager identification numbers (PINs) in the description of the invoice. Figures 16E-16G illustrate charges associated with each of a number of pager units identified by a unique  
20 identification number in the itemization of charges portion of the customer invoice. The PIN number is typically displayed on the Monthly One Time Charge invoice page in the Reference ID column.

A charges extract module 308, shown in both  
25 Figs. 13 and 15, processes special product (i.e., operator dispatch) voucher charges acquired through the open gateway 144 for placement on the customer invoice. A standard header, such as 'Operator Dispatch Charges' shown in the Account Detail portion of the customer  
30 invoice in Fig. 16E, is placed on the invoice to represent these paging usage charges.

In addition, the charges extract module 308 recognizes equipment records acquired through the CPE system. As such, the charges extract module 308 differentiates non-pager related CPE equipment records from company pager equipment records, This level of differentiation is needed to show the appropriate charge description on the invoice report.

A discounts extract module 306 provides for the processing of paging discounts. Paging discounts are identified by the new paging indicator at the end of the CPE discount view. All paging item level discounts are stored in an internal array until the end of account processing, at which point they are written to the invoicing file. Figure 16E illustrates a summary of discounts presented on a customer invoice.

An itemization report formatter module 310 provides for the creation of an itemization of charges report. A voucher view is provided to enable the itemization report formatter module 310 to process special product (e.g., operator dispatch) voucher charges acquired through the open gateway 144 for placement on the customer invoice. Figures 16E-16G illustrate an itemized listing of charges associated with a number of paging units presented on a single composite customer invoice. The charge text description lines in the voucher view for the date and the charge description fields are moved to the invoice report record by the itemization report formatter module 310.

A CPE view is also included as part of the itemization report formatter module 310 to enable the module 310 to process customer premise equipment information. In particular, the itemization report

formatter module 310 differentiates between non-pager related CPE equipment records and company pager equipment records. This level of differentiation is required in order to include the appropriate text description on the customer invoice report. Non-paging equipment records are typically given a default description of 'Equipment.'

The itemization of charges report exit module 312 produces print files for equipment and voucher charges that appear on a customer invoice.

The foregoing description of the various embodiments of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. For example, the consolidated billing system disclosed herein may accommodate billing requirements from services other than those offered by a pager service provider. Further, the telephony network depicted herein may constitute a fiber-optic network, a digital network, a hybrid analog/digital network, or other type of telephony network. Many modifications and variations are possible in light of the above teaching. It is intended that the scope of the invention be limited not by this detailed description, but rather by the claims appended hereto.